

Claims:

1. A metal-coated substrate, having a metal layer provided on one side or both sides of a laminated plastic film having a plurality of plastic film layers, the laminated plastic film comprising:

a plastic film layer as at least a base body; and

a thermoplastic film layer including thermoplastic, wherein the plastic film layer as the base body has  $15 \times 10^{-6}/K$  or less of a difference between linear expansion coefficients of the plastic film layer and the metal layer, and the metal layer is formed on the thermoplastic film layer by a vapor deposition method.

2. The metal-coated substrate according to claim 1, wherein a glass transition temperature of the thermoplastic contained in the thermoplastic film layer is  $180^{\circ}$  or more.

3. The metal-coated substrate according to either of claim 1 or 2, wherein the metal layer is formed, with a temperature of the laminated plastic film controlled at the temperature from the temperature lower than the glass transition temperature of the thermoplastic film by  $100^{\circ}C$  to lower than a decomposition temperature of the thermoplastic film.

4. The metal-coated substrate according to any one of

claims 1 to 3, wherein more than one kind of elements selected from Si, Ti, and Al are contained from a joining interface between the metal layer and the thermoplastic film layer toward the metal layer.

5. The metal-coated substrate according to any one of claims 1 to 4, wherein the vapor deposition method is a sputtering method or an ion plating method.

6. The metal-coated substrate according to any one of claims 1 to 5, wherein a pulling elasticity modulus of the laminated plastic film layer is 1000MPa or more.

7. The metal-coated substrate according to any one of claims 1 to 6, wherein the metal layer is further laminated by a plating method on the metal layer formed by the vapor deposition method.

8. A manufacturing method of a metal-coated substrate, which is the manufacturing method of the metal-coated substrate having a metal layer provided on one side or both sides of a laminated plastic film having a plurality of plastic film layers, comprising:

selecting a plastic film layer as a base body having a difference between linear expansion coefficients of  $15 \times 10^{-6}/K$  or less of the laminated plastic film and the metal layer in

the laminated plastic film;

forming a thermoplastic film containing thermoplastic on one side or both sides of the plastic film layer as a base body; and thereafter

forming the metal layer on the thermoplastic film layer by a vapor deposition method.

9. The manufacturing method of the metal-coated substrate according to claim 8, wherein when the metal layer is formed, a temperature of the laminated plastic film layer is controlled at the temperature from the temperature lower than the glass transition temperature of the thermoplastic film by 100°C to lower than a decomposition temperature of the thermoplastic film.

10. The manufacturing method of the metal-coated substrate according to claim 9, wherein before the metal layer is formed, an organic substance containing more than one kind of elements selected from Si, Ti, and Al is deposited on the thermoplastic film layer.

11. The manufacturing method of the metal-coated substrate according to claim 10, comprising the steps of:

allowing the organic substance containing more than one kind of elements selected from Si, Ti, and Al to be deposited on the thermoplastic film layer before the metal layer is

formed; and

heat-treating at 150°C or more the laminated plastic film having the organic substance containing more than one kind of elements selected from the Si, Ti, and Al deposited thereon.

12. The manufacturing method of the metal-coated substrate according to claim 11, comprising the steps of:

allowing the organic substance containing more than one kind of elements selected from Si, Ti, and Al to be deposited on the thermoplastic film layer before the metal layer is formed; and

heat-treating at 150°C the laminated plastic film having the organic substance containing more than one kind of elements selected from the Si, Ti, and Al deposited thereon,

wherein the above two steps are simultaneously performed.

13. The manufacturing method of the metal-coated substrate according to any one of claims 8 to 12, wherein as a vapor deposition method for forming the metal layer, a sputtering method or an ion plating method is performed.

14. The manufacturing method of the metal-coated substrate according to any one of claims 8 to 13, comprising:

a plating film-forming step by a plating method for laminating the same kind or different kind of metal layer on

the metal layer formed by the vapor deposition method.

15. The manufacturing method of the metal-coated substrate according to claim 14, wherein after the metal layer is formed by the vapor deposition method, or after the plating film forming step, by etching the metal layer, a predetermined circuit pattern is formed on the metal layer.

16. The manufacturing method of the metal-coated substrate according to either of claim 14 or 15, comprising the steps of:

forming a predetermined circuit pattern by providing a resist film on the metal layer formed by the vapor deposition method;

laminating the same or different kind of metal layer by a plating method on the metal layer having the circuit pattern formed thereon; and

removing the resist film, and removing the metal layer under the resist film thus removed,

wherein a predetermined circuit pattern is formed on the metal layer.